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High Technology Input Indicators, 2010: Feeding B.C.'s High Tech Sector

This article is excerpted from the executive summary of the recently released report *Input Indicators of the British Columbia High Technology Sector*. The input indicators cover key aspects of the educational, business, government, external, and labour sectors from the point of view of their impact on high technology firms.

The 2010 edition is available on our website: www.bcstats.gov.bc.ca

Introduction

There is clear value in monitoring the output of the high technology sector, but informed investing and policy-making requires knowledge about the processes that give rise to that output well. The high technology sector is a complex system with many players and interactions. Understanding this system is a matter of identifying the various parts and collecting information that shows how these parts behave and interact over time.

The picture of British Columbia's high tech sector that emerges from the input indicators is varied. In many cases, B.C. compares quite favourably with other provinces and has shown notable growth. On the other hand, performance has lagged in other areas. As such, the detailed indicators have great potential for offering tangible direction for government policies and industry growth strategies.

Where available, data are included for the other provinces, particularly for those supporting the bulk of Canada's high technology sector: Alberta, Manitoba, Ontario and Quebec. Along with B.C., these provinces are referred to throughout the text as the "high technology provinces."

Education

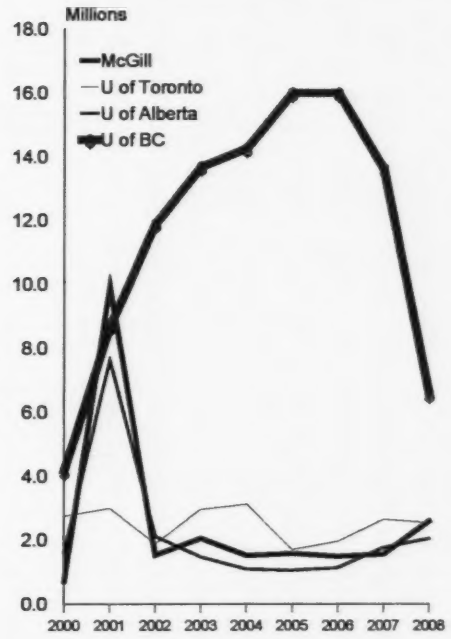
High technology operations often require a specific set of skills and knowledge and, as such, a broad base of highly educated population from which to draw is an important factor to enable expansion of a region's high tech sector.

In general, British Columbia fares quite well in terms of performance in the education sector. British Columbia's universities have excelled in terms of technology licenses and patents issued. The University of British Columbia (UBC) continues to lead all other Canadian G-13 universities in gross income received

from technology licenses. UBC has also been a long-time leader in the number of U.S. patents it has been awarded. The province also fares relatively well in terms of funding for researchers in its educational institutions.

British Columbia is also ahead of the curve when it comes to technology licensing and patents at its universities. The University of British Columbia remains the top university in the country in terms of gross income earned from technology licenses ($6.6 million from technology licences in 2008). Over the past decade, B.C. has also consistently had strong results in terms of the number of U.S. patents awarded to its top institution (UBC) as well as in the number of start-up companies formed.

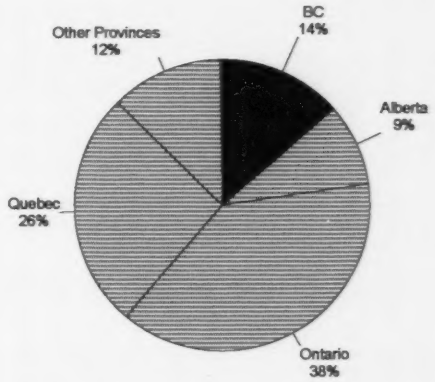
Licensing income has decreased at UBC, but remains well above other leading Canadian institutions



Data Source: Association of University Technology Managers

In 2010, B.C. institutions were home to 255 of the 1,842 research chairs currently in place at Canadian universities. This accounts for 14% of the nation's chairs, more than the combined shares of Atlantic Canada, Saskatchewan and Manitoba.

B.C. is home to more Canada Research Chairs than Saskatchewan, Manitoba and the Atlantic provinces combined



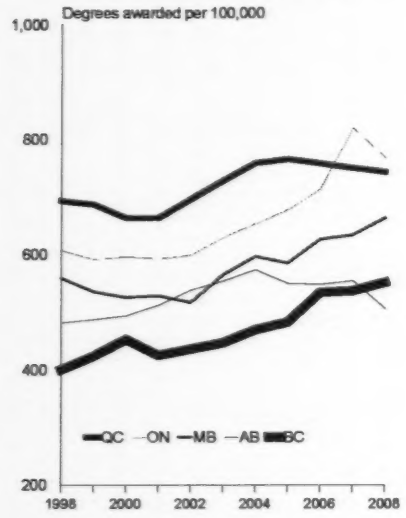
Data Source: Canada Research Chairs Program

While B.C. has led the high technology provinces in the largest portion of its population with a high school diploma (83% in 2009) since at least 1990, it falls short of the other three provinces in the percentage of its population with post-secondary credentials. In 2009, just over 48% of the adult population in B.C. had post-secondary credentials, compared with somewhat higher percentages for Alberta (just under 49%), Ontario (51%) and Quebec (51%).

While the actual number of undergraduate degrees granted has generally been rising in B.C. over the past ten

years, the province has consistently remained the lowest of the high technology provinces in terms of degrees granted per 100,000 persons. However, in 2008, B.C. surpassed Alberta for the first time on record, with 551 degrees granted per 100,000 people.

In 2008, B.C. surpassed Alberta for the first time on record, awarding more undergraduate degrees per capita

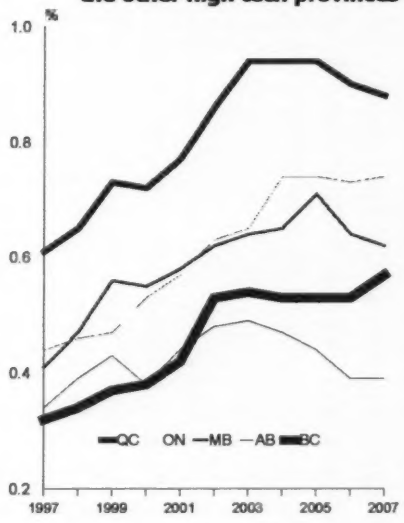


Data Source: Statistics Canada

Among specific disciplines, British Columbia tends to lag other high tech provinces in the number of undergraduate and graduate degrees awarded per year. In 2008, on a per capita basis, the province ranked last among the high tech provinces in number of both graduate and undergraduate degrees awarded to students of architecture, engineering and related technology. At 49.3 per 100,000 persons, the number of B.C. students granted an undergraduate degree in the area of physical and life sciences and technologies also fell short of the Canadian average (52.7). The province fares slightly better in terms of the number of undergraduate degrees awarded in the area of mathematics, computer and information science.

British Columbia also lags other provinces in terms of research and development in its higher education sector. In 2008, B.C.'s ratio of higher education performance of research and development to GDP was 0.6%, below the national average (0.7%). However, relative to the size of the economy, higher education R&D has been trending upwards in B.C. since 1997.

B.C.'s ratio of higher education R&D to GDP remains well above that of Alberta, but trails the other high tech provinces



Data Source: Statistics Canada

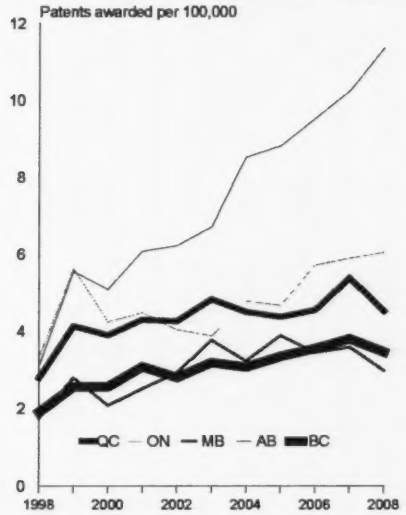
Business

The mixed performance of B.C.'s higher education sector is echoed in the province's business community. Compared to other provinces, British Columbia scores above average in venture capital investment, but lags in some other busi-

ness stimulus indicators, such as patents granted and ICT investment.

Relative to the other high tech provinces, British Columbia has not been particularly successful in patenting new inventions. B.C. applicants were awarded 152 patents in 2008 (the latest year for which data are available), or 3.5 per 100,000 population. This rate falls short of three other high tech provinces and B.C. has ranked fourth or fifth since at least 1998. Despite the comparatively poor performance, patent acceptance has been creeping up in B.C. over the past decade, both in actual number and in ratio per 100,000 persons.

B.C. ranks fourth among the high technology provinces in patents awarded per capita

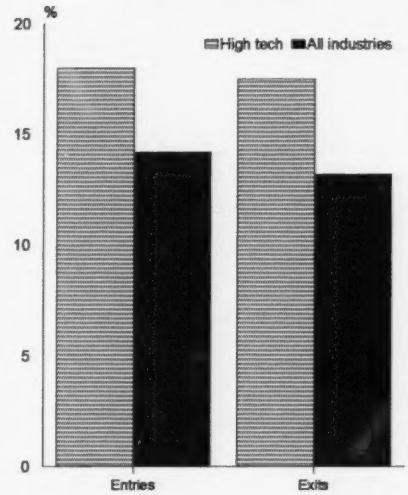


Data Source: Canadian Intellectual Property Office

A good way to measure the strength of a specific sector is to compare it to the overall economy. Between 2007 and 2009 high technology firms had an average annual entry rate of 15.0%, expanding by nearly 260 businesses to reach 8,903 in 2009. By comparison, the number of firms in the B.C. economy as a whole had a much lower average annual entry rate (+11.6%).

Over the same period, the exit rate in the province's high tech sector (+13.5%) was also higher than the average business exit rate (+10.5%), providing further evidence that the innovative atmosphere of high tech businesses may tend to lead towards instability.

Entry and exit rates are higher than average in the high tech sector



Data Source: Statistics Canada

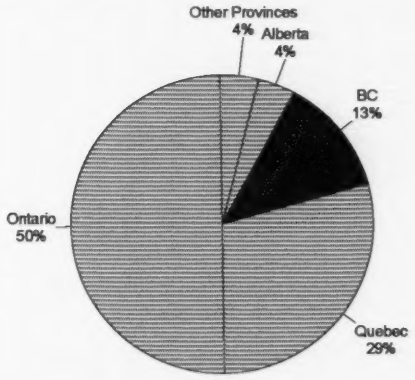
Venture capital investment by province is a good proxy for both the quality of ventures in a given province as well as the venture capitalists' assessment of the business climate.

Usually ranking above the national average, B.C. has fared relatively well in terms of investments per 100,000 population. In 2010, the province had an average venture capital investment of almost $48 per 100,000 persons, up substantially from 2009 ($36), and well

above that of Alberta ($18). Along with maintaining a solid second place ranking among the provinces (remaining well ahead of Ontario's $32 per capita), 2010 marked the first year since 2007 where B.C.'s per capita share has been above the national average. Quebec recorded the highest per capita investment ratio in the country ($49), while Manitoba had the lowest ($9).

In 2010, B.C. boasted a 19% share of the country's venture capital investment, well above the 13% average over the 2000-2010 period, and still a far greater share than in any other province outside Canada's industrial core.

B.C.'s share of Canadian venture capital investment is more than three times that of Alberta



Data Source: Thompson Reuters

British Columbia paints a similar picture to that of the nation as a whole, with investment in the information and communications technologies (ICT) surging 18.3% (to $6.0 billion) between 2006 and 2007.

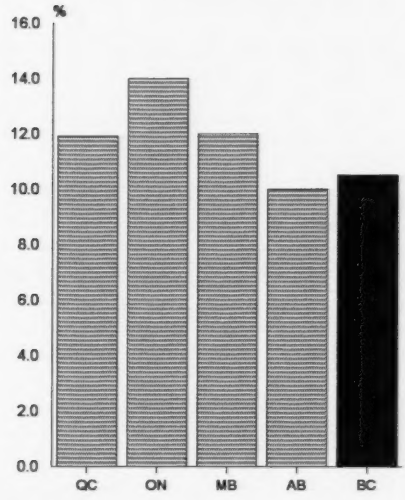
Perhaps the most common measure of the strength of a given sector is its expenditure on research and development. Canada's business sector performed $15.8 billion worth of R&D in 2008 (the latest year for which data are available), amounting to just under one percent of the nation's GDP in that year. Historically, the ratio of business expenditure on R&D (BERD) to provincial GDP has been much higher in Quebec and Ontario than in the rest of the country. In 2008, although well above Alberta (0.5%) and Manitoba (0.3%) in BERD to GDP, B.C. (0.8%) was far exceeded by Ontario (1.3%) and Quebec (1.5%).

Government

The government sector impacts the high technology environment by funding and directly performing R&D, and by providing a regulatory, tax and infrastructure environment for the private sector to operate within.

In recent years, taxation of high-income individuals, small business and corporations has been more favourable in B.C. than in most other provinces. In 2009, B.C. lowered its rate from 4.5% to 2.5% to claim the second lowest rate of its fellow high tech provinces. The rate remained the same in 2010, resting just below that of Alberta (3.0%). British Columbia's general corporate income tax rate (10.5% in 2010) is also lower than every province except Alberta.

Alberta has the lowest corporate tax rate in the country



Data Source: B.C. Ministry of Finance

Generally, direct performance of R&D by government has lagged in B.C. compared to other provinces but, in recent years, has shown signs of growth.

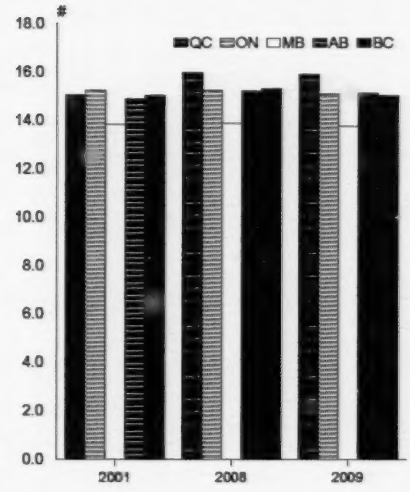
Within the high technology provinces, Ontario has maintained by far the highest ratio of government R&D to GDP (0.30% in 2008) for at least the last 18 years. Compared to all provinces, B.C.'s ratio has historically ranked last and Alberta has held the ninth place rank. These positions held true in 2008, when B.C. saw its ratio inch down to 0.06%, about a third of the Canadian average (0.19%). In that same year, rates for Alberta (0.10%), Manitoba (0.19%) and Quebec (0.17%) were unchanged, while Ontario's (0.30%) advanced slightly.

External

The number of well-trained immigrants to Canada has increased greatly in recent years, and their level of schooling has increased as well. In relation to its population size, British Columbia is on a par with other provinces in attracting skilled immigrants. B.C. is also likely to gain educated and trained workers when there is in-migration from other provinces.

In relation to the size of its population, British Columbia is relatively on par with other provinces in attracting skilled immigrants, but their average level of education is slightly lower than in some other parts of the country.

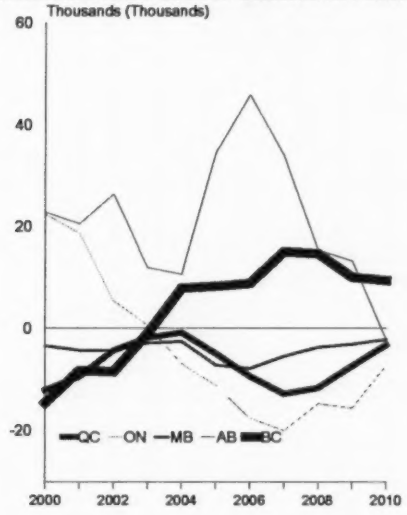
Immigrants to Quebec have the highest median number of years of schooling



Data Source: Statistics Canada

After having experienced an outflow of people from B.C. to other parts of Canada between 1998 and 2003, increased in-migration from other provinces over recent reporting years has begun to bolster the province's supply of workers. Net in-migration to the province eased slightly in 2010, but was still, by far, the largest of any of the provinces.

Inter-provincial migration to B.C. has somewhat mirrored that of Ontario in recent years



Data Source: Statistics Canada

Another external indicator of the overall strength of the high tech environment is its ability to import high tech products and services. B.C. imports of high technology goods—which can be an indicator of future production since imported components are often used to produce high tech products—slumped in 2009, likely as a result of the slowdown in the economy.

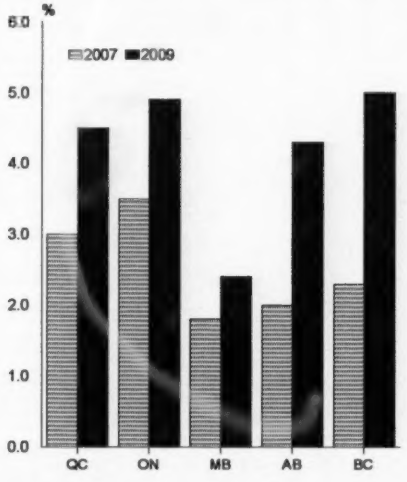
Labour

Indicators that are specific to the labour market, but also represent a combined impact of the source sectors are key in that they aid in determining the health of high tech labour pools.

Nation-wide, rates of unemployment among workers in the natural and applied sciences are consistently well under those for the economy as a whole. In general, unemployment rates have been falling quite consistently since the early 1990s. The past decade has witnessed both the highs and lows of unemployment rates in B.C., from the labour shortage crisis of 2006-2008 to the onset of the economic slowdown that began in late 2008.

Unemployment rates among workers in the natural and applied sciences dropped to a record low in 2008, but climbed substantially in 2009 in the face of the economic downturn. Nonetheless, rates remain substantially lower than for the economy as a whole. In 2007 (the latest year for which data are available) British Columbia maintained a third place ranking in terms of researchers per 100,000 population. The province's research workforce grew substantially between 2006 and 2007, while many other parts of the country saw numbers decline.

The disparity in jobless rates in 2007 and 2009 reflects the effect of the labour crunch compared to that of the economic downturn



Data Source: Statistics Canada

The perceived liveability of a given city is of significant consideration when deciding where to live and work. As such, it can have a substantial impact on labour pools and existing workforces, such as those in high tech fields. Vancouver, B.C. is time and again ranked as having the highest overall quality of life in the Americas and even among the highest in the world. Although the province is made up of many diverse regions, cities and municipalities, as the most populous metropolitan area in the province, Vancouver's high ranking reflects favourably on B.C. as a whole. Also, many of the quality of life variables are at equally high levels in most other parts of the province. The positive ranking for Vancouver bodes well for the entire province, in that it holds great potential to provide a competitive advantage in attracting high tech workers.

Vancouver ranks first in the Americas on the quality of life scale

	Score	Global Rank	Americas Rank
Vancouver	107.4	4	1
Ottawa	105.5	14	2
Toronto	105.3	16	3
Montreal	104.2	21	4
Calgary	103.5	28	5
Honolulu	103.1	31	6
San Francisco	103.0	32	7
Seattle	99.8	50	12

Conclusion

Relative to other parts of the country, British Columbia appears to fare reasonably well with regard to providing an environment that will attract high technology businesses. On the other hand, in other areas, performance has lagged.

Given the importance of the high technology sector in today's global community, along with the potential for boosting business and employment in the province, the environment that B.C. provides is of high significance. If B.C.'s high technology sector is to continue to grow, there must be a continuing effort to ensure that the province maintains the right environment to attract high technology businesses.

B.C. has many of the elements necessary for a successful high technology sector already in place and if government, the education sector and business work together, the province could eventually become a world leader in the technology field.

Indicators of the success, or "outputs", of the high technology sector are covered by a companion report, Profile of the British Columbia High Technology Sector. The Profile contains information on high technology GDP, employment, wages and salaries, revenues, establishment counts, and exports and imports.

For a more detailed look at British Columbia's high technology sector, refer to the 2010 editions of *Input Indicators of the British Columbia High Technology Sector* and *Profile of the British Columbia High Technology Sector*.[1]

[1] Available at http://www.bcstats.gov.bc.ca